# Elbow Dislocation

From HumanResearchWiki

## Contents



## Introduction

Terrestrially, the elbow joint is subject to dislocation as a result of a fall on an extended, abducted arm. During space flight, forces sufficient to cause joint dislocation could be imparted from a high-mass object being moved either inside or outside the vehicle.[1] A dislocated elbow joint is usually flexed at a 45-degree angle, and the olecranon is prominent and posterior to the humeral epicondyles. Complications may include fracture and neurovascular injuries. Treatment is via reduction of the dislocation with gentle traction under analgesia and conscious sedation, followed by immobilization and pain control.[2]

## Clinical Priority and Clinical Priority Rationale by Design Reference Mission

*One of the inherent properties of space flight is a limitation in available mass, power, and volume within the space craft. These limitations mandate prioritization of what medical equipment and consumables are manifested for the flight, and which medical conditions would be addressed. Therefore, clinical priorities have been assigned to describe which medical conditions will be allocated resources for diagnosis and treatment. "Shall" conditions are those for which diagnostic and treatment capability must be provided, due to a high likelihood of their occurrence and severe consequence if the condition were to occur and no treatment was available. "Should" conditions are those for which diagnostic and treatment capability should be provided if mass/power/volume limitations allow. Conditions were designated as "Not Addressed" if no specific diagnostic and/or treatment capability are expected to be manifested, either due to a very low likelihood of occurrence or other limitations (for example, in medical training, hardware, or consumables) that would preclude treatment. Design Reference Missions (DRMs) are proposed future missions designated by a set of assumptions that encompass parameters such as destination, length of mission, number of crewmembers, number of Extravehicular Activities (EVAs), and anticipated level of care. The clinical priorities for all medical conditions on the Exploration Medical Condition List (EMCL) can be found here (https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All_DRM). The EMCL document may be accessed here (https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL_RevC_2013.pdf).*

| Design Reference Mission | Clinical Priority | Clinical Priority Rationale |
|---|---|---|
| Lunar sortie mission<br><br>Assumptions:<br>▪ 4 crewmembers (3 males, 1 female)<br>▪ 14 days total<br>▪ 4 EVAs/ crewmember<br>▪ Level of Care 3 | Not Addressed | Under nominal conditions, crewmembers in the microgravity environment of the moon, either inside a lunar habitat or outside on an EVA, will be unlikely to sustain anything more than minor musculoskeletal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized and the pressurized EVA suit is expected to offer some protection. In addition to a lack of mechanism for such an injury, the resources needed for diagnosis and treatment will already be manifested for other conditions, and, in the rare event that an elbow dislocation occurred, all that would be needed is the procedure for diagnosis and treatment. |
| Lunar outpost mission<br><br>Assumptions:<br>▪ 4 crewmembers (3 males, 1 female)<br>▪ 180 days total<br>▪ 90 EVAs/ crewmember<br>▪ Level of Care 4 | Not Addressed | Under nominal conditions, crewmembers in the microgravity environment of the moon, either inside a lunar habitat or outside on an EVA, will be unlikely to sustain anything more than minor musculoskeletal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized and the pressurized EVA suit is expected to offer some protection. In addition to a lack of mechanism for such an injury, the resources needed for diagnosis and treatment will already be manifested for other conditions, and, in the rare event that an elbow dislocation occurred all that would be needed is the procedure for diagnosis and treatment. |
| Near-Earth Asteroid (NEA) mission<br><br>Assumptions:<br>▪ 3 crewmembers (2 males, 1 female)<br>▪ 395 days total<br>▪ 30 EVAs/ crewmember<br>▪ Level of Care 5 | Not Addressed | Under nominal conditions, crewmembers in the microgravity environment of the NEA mission will be unlikely to sustain anything more than minor musculoskeletal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized. In addition to a lack of mechanism for such an injury, the resources needed for diagnosis and treatment will already be manifested for other conditions, and, in the rare event that an elbow dislocation occurred, all that would be needed is the procedure for diagnosis and treatment. |

# Initial Treatment Steps During Space Flight

*A link is provided to a prior version of the International Space Station (ISS) Medical Checklist, which outlines the initial diagnostic and treatment steps recommended during space flight for various conditions which may be encountered onboard the ISS. Further diagnostic and treatment procedures beyond the initial steps outlined in the Medical Checklist are then recommended by the ground-based Flight Surgeon, depending on the clinical scenario. Please note that this version does not represent current diagnostic or treatment capabilities available on the ISS.*

*While more recent versions of this document are not accessible to the general public, the provided version of the checklist can still provide a general sense of how medical conditions are handled in the space flight environment. Medical Checklists will be developed for exploration missions at a later point in time.*

Please note this file is over 20 megabytes (MB) in size, and may take a few minutes to fully download.

ISS Medical Checklist (http://www.nasa.gov/centers/johnson/pdf/163533main_ISS_Med_CL.pdf)

# Capabilities Needed for Diagnosis

*The following is a hypothetical list of capabilities that would be helpful in diagnosis. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Vital signs measurement capability (blood pressure, pulse)
- Imaging (such as X-ray or ultrasound, including Doppler)

# Capabilities Needed for Treatment

*The following is a hypothetical list of capabilities that would be helpful in treatment. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Crew medical restraint system
- All Cotton Elastic (ACE™) wrap
- Splint [such as a Structural Aluminum Malleable (SAM®) splint]
- Analgesics (non narcotic, narcotic, oral, injectable)
- Skin cleanser [such as alcohol/Benzalkonium antiseptic (BZK)/iodine]
- Medication delivery device (such as a Carpuject Injector)
- Cold packs

# Associated Gap Reports

*The NASA Human Research Program (HRP) identifies gaps in knowledge about the health risks associated with human space travel and the ability to mitigate such risks. The overall objective is to identify gaps critical to human space missions and close them through research and development. The gap reports that are applicable to this medical condition are listed below. A link to all of the HRP gaps can be found here (http://humanresearchroadmap.nasa.gov/Gaps/).*

2.01 - We do not know the quantified health and mission outcomes due to medical events during exploration missions.
2.02 – We do not know how the inclusion of a physician crew medical officer quantitatively impacts clinical outcomes during exploration missions.
3.01 - We do not know the optimal training methods for in-flight medical conditions identified on the Exploration Medical Condition List taking into account the crew medical officer's clinical background. (Closed)
4.01 - We do not have the capability to provide a guided medical procedure system that integrates with the medical system during exploration missions.
4.02 - We do not have the capability to provide non-invasive medical imaging during exploration missions.
4.06 - We do not have the capability to stabilize bone fractures and accelerate fracture healing during exploration missions.
4.07 - Limited wound care capability to improve healing following wound closure (Closed)
4.08 - We do not have the capability to optimally treat musculoskeletal injuries during exploration missions.
4.14 - We do not have the capability to track medical inventory in a manner that integrates securely with the medical system during exploration missions.
4.15 - Lack of medication usage tracking system that includes automatic time stamping and crew identification
4.17 - We do not have the capability to package medications to preserve stability and shelf-life during exploration missions.
4.24 - Lack of knowledge regarding the treatment of conditions on the Space Medicine Exploration Medical Condition List in remote, resource poor environments (Closed)
5.01 - We do not have the capability to comprehensively manage medical data during exploration missions.

# Other Pertinent Documents

# List of Acronyms

| | |
|---|---|
| **A** | |
| ACE™ | All Cotton Elastic |
| | |
| **B** | |
| BZK | Benzalkonium antiseptic |
| | |
| **D** | |
| DRM | Design Reference Mission |
| | |
| **E** | |
| EMCL | Exploration Medical Condition List |
| EVA | Extravehicular Activity |
| | |
| **H** | |
| HRP | Human Research Program |
| | |
| **I** | |
| ISS | International Space Station |
| | |
| **M** | |
| MB | Megabyte |
| | |
| **N** | |

| | |
|---|---|
| NASA | National Aeronautics and Space Administration |
| NEA | Near Earth Asteroid |
| NEISS | National Electronic Injury Surveillance System |
| | |
| **S** | |
| SAM® | Structural Aluminum Malleable |
| | |
| **U** | |
| U.S. | United States |

# References


1. Marshburn TH. Acute Care. In: Barratt M, Pool S, editors. Principles of Clinical Medicine for Space Flight. New York: Springer; 2008. p. 101-22..
2. American Academy of Orthopedic Surgeons. Elbow Dislocations and Fracture-Dislocations. American Academy of Orthopedic Surgeons (AAOS). 2007. American Academy of Orthopedic Surgeons (AAOS). 8-8-2011


# Last Update

This topic was last updated on 8/12/2014 (Version 2).



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